

Eur päisches Patentamt  
European Patent Office  
Office européen des brevets



(11) EP 0 928 726 A2

(12) EUROPEAN PATENT APPLICATION

(43) Date of publication:  
14.07.1999 Bulletin 1999/28

(51) Int. Cl.<sup>6</sup>: B60T 7/06

(21) Application number: 99100451.6

(22) Date of filing: 11.01.1999

(84) Designated Contracting States:  
AT BE CH CY DE DK ES FI FR GB GR IE IT LI LU  
MC NL PT SE  
Designated Extension States:  
AL LT LV MK RO SI

(30) Priority: 13.01.1998 JP 509098  
13.01.1998 JP 495498

(71) Applicants:  
• NISSAN MOTOR CO., LTD.  
Yokohama-shi Kanagawa-ken (JP)  
• Yorozu Corporation  
Yokohama-shi, Kanagawa-ken (JP)

(72) Inventors:  
• Mizuma, Hiroyuki  
Hadano-shi, Kanagawa-ken (JP)

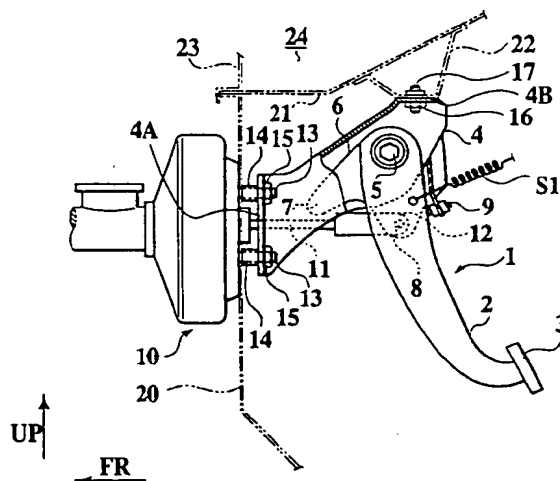
• Kawahara, Sadahiro  
Ebina-shi, Kanagawa-ken (JP)  
• Kobayashi, Tohru  
c/o Yorozu Corporation  
Yokohama-shi, Kanagawa-ken (JP)  
• Gouhara, Sunao  
c/o Yorozu Corporation  
Yokohama-shi, Kanagawa-ken (JP)

(74) Representative:  
Weber, Joachim, Dr.  
Hofer, Schmitz, Weber  
Patentanwälte  
Gabriel-Max-Strasse 29  
81545 München (DE)

(54) Brake pedal structure for vehicle

(57) A brake pedal structure for a vehicle disclosed herein includes a pedal bracket (4) provided on a dash panel (20) of the vehicle, a pedal shaft (5) provided on the pedal bracket, a pedal arm (2) pivotally supported by the pedal shaft in a freely rotatable manner around the pedal shaft as a rotational axis, and a push rod (11) connected to the pedal arm for operating a brake system of the vehicle in response to rotation of the pedal arm. The push rod has a portion so as to interrupt the transmission of a load input at the time of collision of said vehicle.

FIG.1



EP 0 928 726 A2

## Description

### BACKGROUND OF THE INVENTION

#### 1. Field of the Invention

[0001] This invention relates to a structure of a brake pedal apparatus for vehicle, that is, relates to a brake pedal structure for a vehicle.

#### 2. Description of the Related Art

[0002] A brake pedal apparatus for a vehicle is, as shown in Japanese Utility Model Application Laid-Open No. 6-1113, structured such that a pedal bracket supporting an upper end portion of a pedal arm in a freely rotatable manner is fastened to a dash lower panel and a lower surface portion of a dash upper panel connected to the dash lower panel and projecting to a vehicle cabin, and that a push rod connected to the upper end portion of the pedal arm is forward pressed when a driver steps on the pedal arm, thereby operating a Master vac.

[0003] When the Master vac or the dash lower panel fixing the Master vac is deformed so as to be backward moved toward the vehicle cabin at a time of a front collision of the vehicle, a rotational force in a direction inverse to a stepping direction of the pedal arm is operated on the pedal arm through the push rod of the Master vac. Accordingly, a stepping position of the pedal arm is rearward shifted and there may be a case that a feeling of physical disorder is generated for the driver.

### SUMMARY OF THE INVENTION

[0004] An object of the present invention is to provide a brake pedal structure for a vehicle which allows to substantially prevent a collision load from operating on a pedal arm through a push rod typically connected to a Master vac at a time of a front collision of a vehicle so that a driver of the vehicle may not feel physical disorder.

[0005] To achieve the above object, a brake pedal structure for a vehicle according to the present invention basically comprises: a pedal bracket provided on a dash panel of the vehicle; a pedal shaft provided on the pedal bracket; a pedal arm pivotally supported by the pedal shaft in a freely rotatable manner around the pedal shaft as a rotational axis; and a push rod connected to the pedal arm for operating a brake system of the vehicle in response to rotation of the pedal arm. Here, this push rod includes a portion so as to interrupt the transmission of a load input at the time of collision of the vehicle.

[0006] With this structure, in a normal state, a stepping force is transmitted to a brake system through the push rod by stepping operation of the pedal arm, and a brake operation as in a general brake pedal structure can be conducted. Further, when the push rod retreats

due to ahead-on collision of the vehicle, the push rod efficiently interrupts the transmission of the load input and thus, it is possible to prevent the collision load from being substantially applied to the pedal arm.

[0007] More specifically, the brake pedal structure for a vehicle of the present invention further comprises a connection portion between the pedal arm and the push rod. This connection portion is disposed at a position offset from an arm portion of the pedal arm in a width-wise direction of the vehicle. Also, the push rod is provided at an end of the connection portion rearward of the vehicle with a pin member, and the connection portion comprises a notch, which opens downward of the vehicle and engages the pin member of the push rod to connect the pedal arm and the push rod with each other, and a projection, which is provided on an end of the connection portion forward of the vehicle. Here, the projection of the connection portion pushes the push rod downward of the vehicle to release the engagement of the notch of the connection portion and the pin member of the push rod when a load input in a rearward direction of the vehicle is applied to the connection portion through the push rod at the time of a collision of the vehicle.

[0008] With this structure, when the push rod retreats due to the head-on collision of the vehicle, since the push rod is moved downward of the vehicle so as to be disengaged, the transmission of the load input can reliably be interrupted. Further, even after the push rod is disengaged, since the connection portion between the pedal arm and the push rod is disposed at a position offset from the arm portion of the pedal arm in the width-wise direction of the vehicle, it is possible to prevent the push rod from interfering with the arm portion of the pedal arm, and since the push rod is pushed downward, it is possible to prevent the push rod from interfering with other peripheral parts such as the steering member.

[0009] Here, it is preferable that the connection portion is a push rod lever integrally connected to the pedal arm. This is because that the offset distance between the connection portion and the arm portion of the pedal arm can be secured sufficiently, and after the push rod is separated, it is possible to reliably prevent the push rod from interfering with the arm portion of the pedal arm.

[0010] Further, the opening of the notch of the connection portion includes a pin-drop-preventing portion by which the pin member can separate from the notch when a load input from the pin member which slides in a downward direction of the vehicle exceeds a predetermined value at the time of the collision of the vehicle.

[0011] In the case that this structure is employed, as long as the collision load transmitted through the push rod does not exceed the predetermined value due to the head-on collision of the vehicle, the pin-drop-preventing portion can prevent the push rod from being separated, and it is possible to enhance the reliability of the normal

state.

[0012] Further, it is preferable that the opening of the notch of the connection portion opens downward and forward of the vehicle. When the brake pedal is stepped in the normal state, the notch and the pin member at the rear end of the push rod are engaged with each other deeper as the brake pedal is stepped stronger and therefore, the engagement is not released. However, when the push rod retreats at the time of the head-on collision of the vehicle, the engagement becomes shallower and is prone to be disengaged. Therefore, it is possible to enhance both reliability of the normal state and reliability at the time of collision.

[0013] Further, an end of the push rod rearward of the vehicle may be preferably connected to the pedal arm, the pedal arm may be preferably provided at its end forward of the vehicle with a projection. And in such a structure, the pedal arm push the push rod downward of the vehicle to bend the push rod when a load input in a rearward direction of the vehicle is applied to the pedal arm through the push rod at the time of a collision of the vehicle.

[0014] With this structure, in a normal state, a stepping force is transmitted to a brake system through the push rod by stepping operation of the pedal arm, and a brake operation as in a general brake pedal structure can be conducted. Further, when the push rod retreats due to ahead-on collision of the vehicle, the push rod interrupts the transmission of the load input, it is possible to prevent the collision load from being applied to the pedal arm.

[0015] It is also preferable that the push rod includes an easily-bendable portion which is bent if the push rod receives a load input acting in a direction other than an axial direction of the push rod.

[0016] Since the easily-bendable portion is provided, when the push rod is pushed down and bent by the projection provided at the front end of the pedal arm, it is possible to further easily bend and deform the push rod, and to reliably prevent the collision load from being applied to the pedal arm.

[0017] Here, it is preferable that the projection of the pedal arm abuts against the push rod in the vicinity of the easily-bendable portion when a load input in a rearward direction of the vehicle is applied to the pedal arm through the push rod at the time of the collision of the vehicle. Because the push rod can be bent and deformed more reliably, and it is possible to prevent the collision load from being applied to the pedal arm.

[0018] Further, if the structure in which the push rod is bent is employed, it is preferable that the projection of the pedal arm is provided at an end thereof downward of the vehicle with a push rod catching portion extending in a widthwise direction of the vehicle. With this structure, it is possible to surely bend and deform the push rod downward, and to enhance the reliability.

[0019] In addition, it is preferable that the push rod is connected to a Master vac of the vehicle because

smooth and reliable braking operation in the normal state can be ensured.

## BRIEF DESCRIPTION OF THE DRAWINGS

[0020]

Fig. 1 is a side view, partly in section, showing a first embodiment of a brake pedal structure for a vehicle of the present invention;

Fig. 2 is an exploded perspective view of the embodiment;

Fig. 3 is an explanatory diagram of the embodiment for explaining a separating operation of a push rod;

Fig. 4 is an explanatory diagram of the embodiment for explaining an operation when a brake pedal is stepped on;

Fig. 5 is an explanatory diagram of the embodiment for explaining an operation when the push rod starts retreating;

Fig. 6 is a side view, partly in section, showing a second embodiment of a brake pedal structure for a vehicle of the present invention;

Fig. 7 is an exploded perspective view of the embodiment; and

Fig. 8 is an explanatory diagram of the embodiment for explaining a bending deformation of a push rod.

## DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0021] Each of embodiments of the present invention will be explained in detail below with reference to the accompanying drawings.

[0022] A first embodiment of a brake pedal structure for a vehicle of the present invention will be explained first.

[0023] In Figs. 1 to 5, the forward direction of the vehicle is indicated with the arrow FR, the upward direction of the vehicle is indicated with the arrow UP, and the reference numeral 1 represent a brake pedal unit.

[0024] The brake pedal unit 1 comprises a pedal arm 2 provided at its lower end with a pedal pad 3, and a pedal bracket 4 for pivotally supporting an upper end of the pedal arm 2 in freely rotatable manner around a pedal shaft 5 as a rotational axis. A rotational force is applied to the pedal arm 2 rearward of the vehicle (counterclockwise direction in Fig. 1) by a return spring S1.

[0025] The reference number 10 represent a Master vac which is disposed on a side surface of the dash lower panel 20 at the side of an engine room for generating a hydraulic pressure in a brake unit (not shown) by pressing the pedal arm 2 connected to a push rod 11 by stepping. The push rod 11 normally connects between the Master vac 10 and the pedal arm 2.

[0026] Here, a connection portion between the push rod 11 and the pedal arm 2 is located at a position offset

in a widthwise direction (in a direction perpendicular to the paper surface of Fig. 1) of the vehicle from the arm portion of the pedal arm 2. The connection portion is formed with a notch 8 which is opened downward and forward of the vehicle in a normal state. This notch 8 is engaged with a pin 12 provided on a rear end of the push rod 11 connected to the Master vac 10 so as to connect the push rod 11 and the pedal arm 2 with each other. The connection portion is provided with a projection 7 so that when a rearward force is applied to a front end of the connection portion through the push rod 11 at the time of head-on collision of the vehicle, the projection 7 pushes down the push rod 11 to release the engagement between the push rod 11 and the pedal arm 2.

[0027] More specifically, a push rod lever 6 is pivotally supported by the pedal shaft 5 in freely rotatable manner around the pedal shaft 5 as a rotational axis. The pin 12 is engaged with the notch 8 formed at a lower end of a rear portion of the push rod lever 6 for bringing the push rod lever 6 and the push rod 11 into engagement. The push rod lever 6 is provided at its front end with the projection 7 so that when the rearward input is applied to the front end of the connection portion through the push rod 11 at the time of head-on collision of the vehicle, the projection 7 pushes down the push rod 11 to release the engagement between the notch 8 and the pin 12.

[0028] As shown especially in Fig. 2, the pedal arm 2 and the push rod lever 6 are connected at their upper ends to the collar 25 and the pedal shaft 5 is fitted in the collar 25 so that the pedal arm 2 and the push rod lever 6 can rotate integrally.

[0029] The Master vac 10 is provided at its rear side surface with a plurality of stud bolts 13, the push rod 11 and the stud bolts 13 are passed through the dash lower panel 20, collars 14 are disposed on projecting portions of the stud bolts 13 at the side of the vehicle cabin, a front wall 4A of the pedal bracket 4 is contacted with the collars 14, and the Master vac 10 and the pedal bracket 4 are attached in the vehicle through the collars 14.

[0030] More specifically, in a state where the dash lower panel 20 is sandwiched between the collars 14 and a rear surface of the Master vac 10, the stud bolts 13 are threaded into nuts 15 and fastened, so that the Master vac 10 and the front wall 4A of the pedal bracket 4 are fastened and fixed together to the dash lower panel 20.

[0031] Here, a dash upper panel 21 constituting an air box 24 is jointed to an upper end of the dash lower panel 20. The dash upper panel 21 also functions as a framework member of a front waist portion of the vehicle in a widthwise direction of the vehicle in cooperation with a cowl top panel 23.

[0032] A vehicle side bracket 22 is jointed to and disposed on a lower surface of the dash upper panel 21, and an upper wall 4B of the pedal bracket 4 is fastened and fixed to the vehicle side bracket 22 by a bolt 16 and

a nut 17.

[0033] In addition, an opening of a lower end of the notch 8 formed in the rear end of the push rod lever 6 is set narrower than a diameter of the pin 12 as a kind of a pin-drop-preventing portion 8a as shown in Fig. 3. That is, the opening prevents the pin 12 from slipping off in a normal state shown with broken lines in Fig. 3, and at the time of the head-on collision of the vehicle, push rod lever 6 rotates in the direction of arrow A, and if an input applied from the pin 12 which slides downward of the vehicle exceeds a predetermined value, the opening opens so that the pin 12 can be separated from the opening.

[0034] In Fig. 1, the reference number 9 represents a stopper for restraining the rearward rotation of the pedal arm 2. More specifically, as shown in Fig. 5, an on/off switch 9a for turning on or off a brake lamp is attached to a lower end of the stopper 9, and the rotation of the pedal arm 2 is restrained by abutting a bracket 2a attached to the pedal arm 2 against the switch 9a.

[0035] This stopper 9 is welded to the pedal bracket as shown with \* in Fig. 5, and a strength of the stopper 9 is set such that the stopper is appropriately deformed if it receives a load greater than a predetermined value generated when the vehicle collides head-on and the pedal arm 2 retreats.

[0036] In the above described structure, the push rod lever 6 is pivotally supported by the pedal shaft 5 and integrally connected to the pedal arm 2.

[0037] The connection portion between the pedal arm 2 and the push rod 11 of the Master vac 10 is disposed at a position offset in the widthwise direction of the vehicle from the arm portion of the pedal arm 2.

[0038] More specifically, the push rod lever 6 is formed at its lower end of the portion with the notch 8 which is opened downward and forward, the notch 8 is engaged and connected with the pin 12 provided on the rear end of the push rod 11 of the Master vac 10, and the push rod lever 6 is provided at its front end with the projection 7 which pushes down the push rod 11 to release the engagement between the push rod 11 and the pin 12 when the rearward input is applied to the push rod lever 6 through the push rod 11 at the time of head-on collision of the vehicle.

[0039] Therefore, in the normal state, the pin 12 provided at the rear end of the push rod 11 deeply engages in the notch 8 as shown in Fig. 4, so that if the pedal arm 2 is stepped to turn the pedal arm 2 in the direction of the arrow B in Fig. 4, the stepping force is reliably transmitted to the Master vac 10 through the push rod 11, and the operation of Master vac as in a general brake pedal structure can be conducted.

[0040] Further, if the Master vac 10 is retreated due to the head-on collision of the vehicle, and the push rod 11 is correspondingly retreated in the direction of the arrow C in Fig. 5, a degree of engagement between the notch 8 and the pin 12 provided at the rear end of the push rod 11 becomes shallower, the push rod lever 6 is turned in

the direction of the arrow D in Fig. 5, and the projection 7 pushes down the push rod 11 to separate the push rod 11 from the push rod lever 6. Therefore, it is possible to effectively prevent the collision load from being applied to the pedal arm 2.

[0041] Further, even after the push rod 11 is separated, since the connection portion between the pedal arm 2 and the push rod 11 is disposed offset from the arm portion of the pedal arm 2 in the widthwise direction of the vehicle, it is possible to prevent the push rod 11 from interfering with the arm portion of the pedal arm 2, and since the push rod 11 is pushed downward, it is possible to prevent the push rod 11 from interfering with other peripheral parts such as the steering member.

[0042] More specifically, since the pedal arm 2 and the push rod 11 are connected to each other through the push rod lever 6 which is integrally connected to the pedal arm 2 pivotally supported by the pedal shaft 5, the offset distance between the connection portion, which is disposed between the push rod 11 and the pedal arm 2, and the arm portion of the pedal arm 2 can be secured sufficiently, and after the push rod 11 is separated, it is possible to reliably prevent the push rod 11 from interfering with the arm portion of the pedal arm 2.

[0043] Further, that opening of the notch 8 provided at the lower end of the rear portion of the push rod lever 6 which is the connection portion between the pedal arm 2 and the push rod 11 is provided with the pin-drop-preventing portion 8a which can be separated if the force applied from the pin 12 which slides downward exceeds the predetermined value. Therefore, as long as the collision load transmitted through the push rod 11 does not exceed the predetermined value due to the head-on collision of the vehicle, the pin-drop-preventing portion 8a can prevent the push rod 11 from being separated, and it is possible to enhance the reliability of both the engaging operation and the disengaging operation.

[0044] Next, a second embodiment of the brake pedal structure for the vehicle of the present invention will be explained.

[0045] In Figs. 6 to 8, the forward direction of the vehicle is indicated with the arrow FR, the upward direction of the vehicle is indicated with the arrow UP, and the reference number 51 represents the brake pedal unit.

[0046] The brake pedal unit 51 comprises a pedal arm 52 provided at its lower end with a pedal pad 53, and a pedal bracket 54 for pivotally supporting an upper end of the pedal arm 52 in freely rotatable manner around a pedal shaft 55 as a rotational axis. The pedal arm 52 applies the rotational force in the rearward direction of the vehicle which is the counterclockwise direction in Fig. 6 by a return spring S2.

[0047] The reference number 60 represent a Master vac which is disposed on a side surface of the dash lower panel 70 at the side of an engine room for generating a hydraulic pressure in a brake unit (not shown) by pressing the pedal arm 52 connected to a push rod 61 by stepping.

[0048] A rear portion of the push rod 61 is connected with an upper portion of an arm portion of the pedal arm 52 through a pin 62.

[0049] Further, the pedal arm 52 is provided at its front end with a projection 56 at a position below the pedal shaft 55 and above the push rod 61. When the vehicle collides head-on and a rearward force is applied to the pedal arm 52 through the push rod 61, the projection 56 pushes down the push rod 61 to bend and deform it so as to prevent the push rod 61 from propping against the pedal arm 52.

[0050] Furthermore, the Master vac 60 is provided at its rear side surface with a plurality of stud bolts 63, and the push rod 61 and the stud bolts 63 are passed through a dash lower panel 70. In a state where a front wall 54A of the pedal bracket 54 is contacted with projecting portions of the stud bolts 63 at the side of the vehicle cabin through collars 64, and the dash lower panel 70 is sandwiched between the collars 64 and the rear side surface of the Master vac 60, the stud bolts 63 are threaded and fastened to nuts 65, thereby fastening the Master vac 60 and the front wall 54A of the pedal bracket 54 to the dash lower panel 70 so that the Master vac 60 and the pedal bracket 54 are fixed to the vehicle.

[0051] Here, a dash upper panel 71 constituting an air box 74 is jointed to an upper end of the dash lower panel 70. The dash upper panel 71 also functions as a framework member of a front waist portion of the vehicle in a widthwise direction of the vehicle in cooperation with a cowl top panel 73. A vehicle side bracket 72 is jointed to and disposed on a lower surface of the dash upper panel 71, and an upper wall 54B of the pedal bracket 54 is fastened and fixed to the vehicle side bracket 72 by a bolt 66 and a nut 67.

[0052] The push rod 61 has a sufficient strength with respect to a force in the axial direction at the time of normal braking operation. The push rod 61 is provided with an easily-bendable portion 57 having a rod diameter smaller than other portions so as to facilitate the push rod 61 to be bent and deformed when the push rod 61 is pushed down by the projection 56 at the front end of the pedal arm 52 at the time of the head-on collision of the vehicle.

[0053] Of course, the projection 56 of the pedal arm 52 is set such that it approaches and abuts against the easily-bendable portion 57 when the rearward force is applied to the push rod 61 at the time of the head-on collision of the vehicle, and the projection 56 is provided at its lower end with pins 59 projecting left and right directions of the vehicle as push rod catching portions.

[0054] In Fig. 6, the reference number 58 represents a stopper bracket for restraining the rearward rotation of the pedal arm 52, and the reference number 58a represents a stopper lamp switch which abuts against the pedal arm 52 when the pedal arm 52 is not stepped.

[0055] According to the above structure, in a normal state, the projection 56 does not abut against the push rod 61, and the projection 56 is moved in a direction to

separate from the push rod 61 when the pedal arm 52 is stepped. Therefore, no force is applied to the push rod 61. Thus, in the normal state, the operation of Master vac 60 that the stepping force is transmitted to the Master vac 60 through the push rod 61 connected to the pedal arm 52 can be conducted as in a general brake pedal structure.

[0056] On the other hand, when the vehicle collides head-on, the Master vac 60 retreats, the push rod 61 correspondingly retreats as in Fig. 8 showing that a state indicated with broken lines is changed to a state indicated with solid line, and the pedal arm 52 is rotated in rearward direction of the vehicle shown with arrow in Fig. 8 while deforming the stopper bracket 58. However, the projection 56 downwardly moves and abuts against the push rod 61 so as to bent the push rod 61 to prevent it from propping against the pedal arm 52. Therefore it is possible to substantially prevent the collision load from being applied to the pedal arm 2.

[0057] That is, the push rod 61 has a sufficient strength with respect to a force in the axial direction at the time of normal braking operation. The push rod 61 is provided with an easily-bendable portion 57 to facilitate the push rod 61 to be bent and deformed when the push rod 61 is pushed down by the projection 56 at the front end of the pedal arm 52 at the time of the head-on collision of the vehicle. Therefore, when the projection 56 at the front end of the pedal arm 52 pushes down and bends the push rod 61, it is possible to easily bend and deform the push rod 61, and to effectively prevent the collision load from being applied to the pedal arm 52.

[0058] Further, since the projection 56 at the front end of the pedal arm 52 is set such as to approach and abut against the easily-bendable portion 57 when a rearward force is applied to the push rod 61, it is possible to bend and deform the push rod 61 more reliably, and to reliably prevent the collision load from being applied to the pedal arm 52.

[0059] In addition, since the projection 56 is provided at its lower end with the pins 59 as the push rod catching portions, even if the position of the push rod 61 is deviated in the lateral direction of the vehicle due to a shock at the time of the head-on collision of the vehicle, it is possible to reliably bend and deform the push rod 61 downwardly, and to enhance the reliability of the operation.

[0060] Although the push rod lever is connected to the Master vac in each of the above embodiments, this is not an indispensable structure of course when the brake system does not include the Master vac, and the same effect of the present invention can be obtained only if the push rod lever is extended in the longitudinal direction of the vehicle and is connected to the brake system for operating the same.

[0061] The entire contents of a Patent Application No. TOKUGANHEI 10-5090, with a filing date of January 13, 1998 in Japan, and a patent Application No. TOKUGANHEI 10-4954, with a filing date of January 13, 1998

in Japan, are hereby incorporated by reference.

[0062] Although the invention has been described above by reference to certain embodiments of the invention, the invention is not limited to the embodiments described above. Modifications and variations of the embodiments described above will occur to those skilled in the art, in light of the teachings. The scope of the invention is defined with reference to the following claims.

## Claims

### 1. A brake pedal structure for a vehicle, comprising:

a pedal bracket provided on a dash panel of said vehicle;  
a pedal shaft provided on said pedal bracket;  
a pedal arm pivotally supported by said pedal shaft in a freely rotatable manner around said pedal shaft as a rotational axis; and  
a push rod connected to said pedal arm to operate a brake system of said vehicle in response to rotation of said pedal arm in a normal state, said push rod including a portion to interrupt a transmission of a load input at the time of collision of said vehicle.

### 2. A brake pedal structure for a vehicle according to claim 1, further comprising a connection portion between said pedal arm and said push rod, said connection portion having a projection being positioned apart from said push rod in said normal state and being positioned to come into contact with said push rod in such a manner that said projection pushes said push rod downward of said vehicle at the time of a collision of said vehicle.

### 3. A brake pedal structure for a vehicle according to claim 2, wherein said connection portion is disposed at a position offset from an arm portion of said pedal arm in a widthwise direction of said vehicle and said push rod is provided at an end thereof rearward of said vehicle with a pin member, and wherein said connection portion further comprises a notch which opens downward of said vehicle and engages said pin member of said push rod to connect said pedal arm and said push rod with each other, and said projection of said connection portion is provided on an end of said connection portion forward of said vehicle and pushes said push rod downward of said vehicle to release an engagement between said notch of said connection portion and said pin member of said push rod when a load input in a rearward direction of said vehicle is applied to said connection portion through said push rod at the time of a collision of said vehicle.

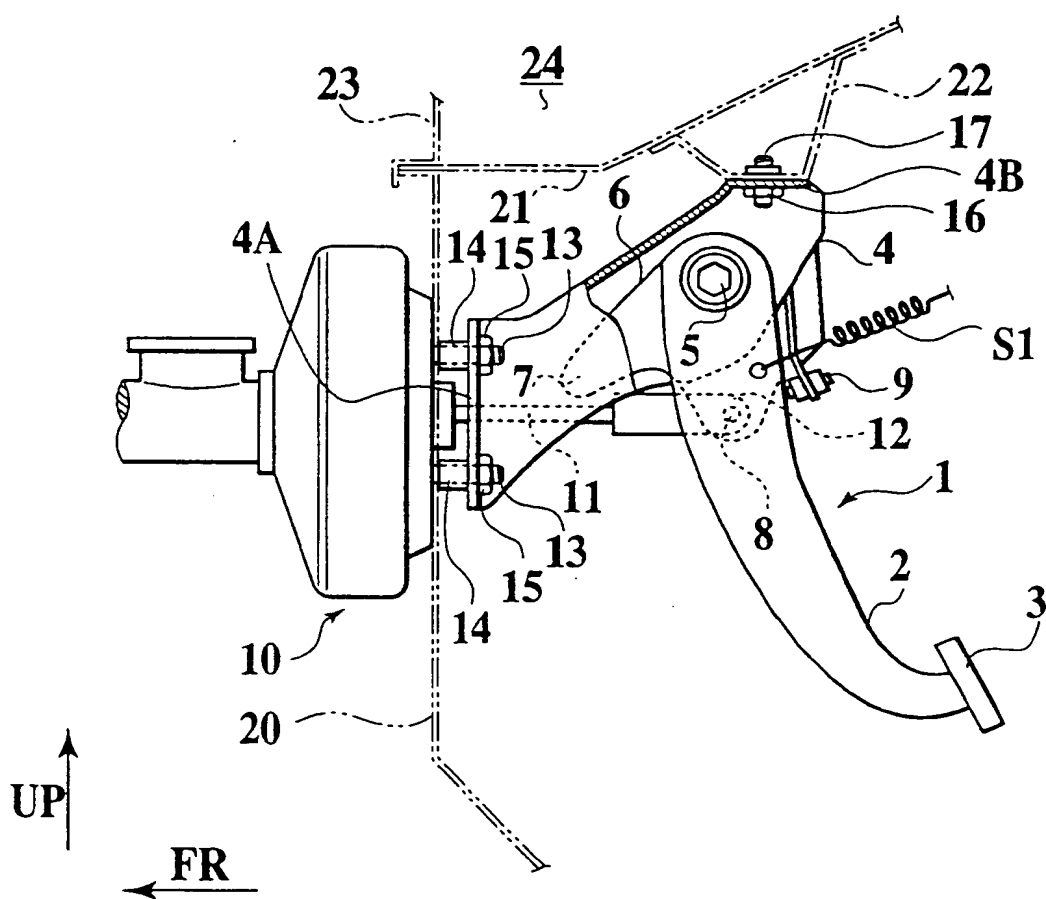
### 4. A brake pedal structure for a vehicle according to

claim 3, wherein said connection portion is a push rod lever integrally connected to said pedal arm.

5. A brake pedal structure for a vehicle according to claim 3, wherein said opening of said notch of said connection portion includes a pin-drop-preventing portion by which said pin member is separable from said notch when a load input from said pin member which slides in a downward direction of said vehicle exceeds a predetermined value at the time of the collision of said vehicle. 5 10
6. A brake pedal structure for a vehicle according to claim 3, wherein said opening of said notch of said connection portion opens downward and forward of said vehicle. 15
7. A brake pedal structure for a vehicle according to claim 1, wherein said push rod is connected to said pedal arm, and said pedal arm has a projection, said projection of said pedal arm being positioned apart from said push rod in said normal state and being positioned to come into contact with said push rod in such a manner that said projection pushes said push rod downward of said vehicle at the time of a collision of said vehicle. 20 25
8. A brake pedal structure for a vehicle according to claim 7, wherein an end of said push rod rearward of said vehicle is connected to said pedal arm, and said pedal arm is provided at an end thereof forward of said vehicle with said projection, said projection of said pedal arm pushing said push rod downward of said vehicle to bend said push rod when a load input in a rearward direction of said vehicle is applied to said pedal arm through said push rod at the time of a collision of said vehicle. 30 35
9. A brake pedal structure for a vehicle according to claim 7, wherein said push rod includes an easily-bendable portion which is bendable when said push rod receives a load input acting in a direction other than an axial direction of said push rod. 40
10. A brake pedal structure for a vehicle according to claim 9, wherein said projection of said pedal arm abuts against said push rod in the vicinity of said easily-bendable portion when a load input in a rearward direction of said vehicle is applied to said pedal arm through said push rod at the time of the collision of said vehicle. 45 50
11. A brake pedal structure for a vehicle according to claim 7, wherein said projection of said pedal arm is provided at an end thereof downward of said vehicle with a push rod catching portion extending in a widthwise direction of said vehicle. 55

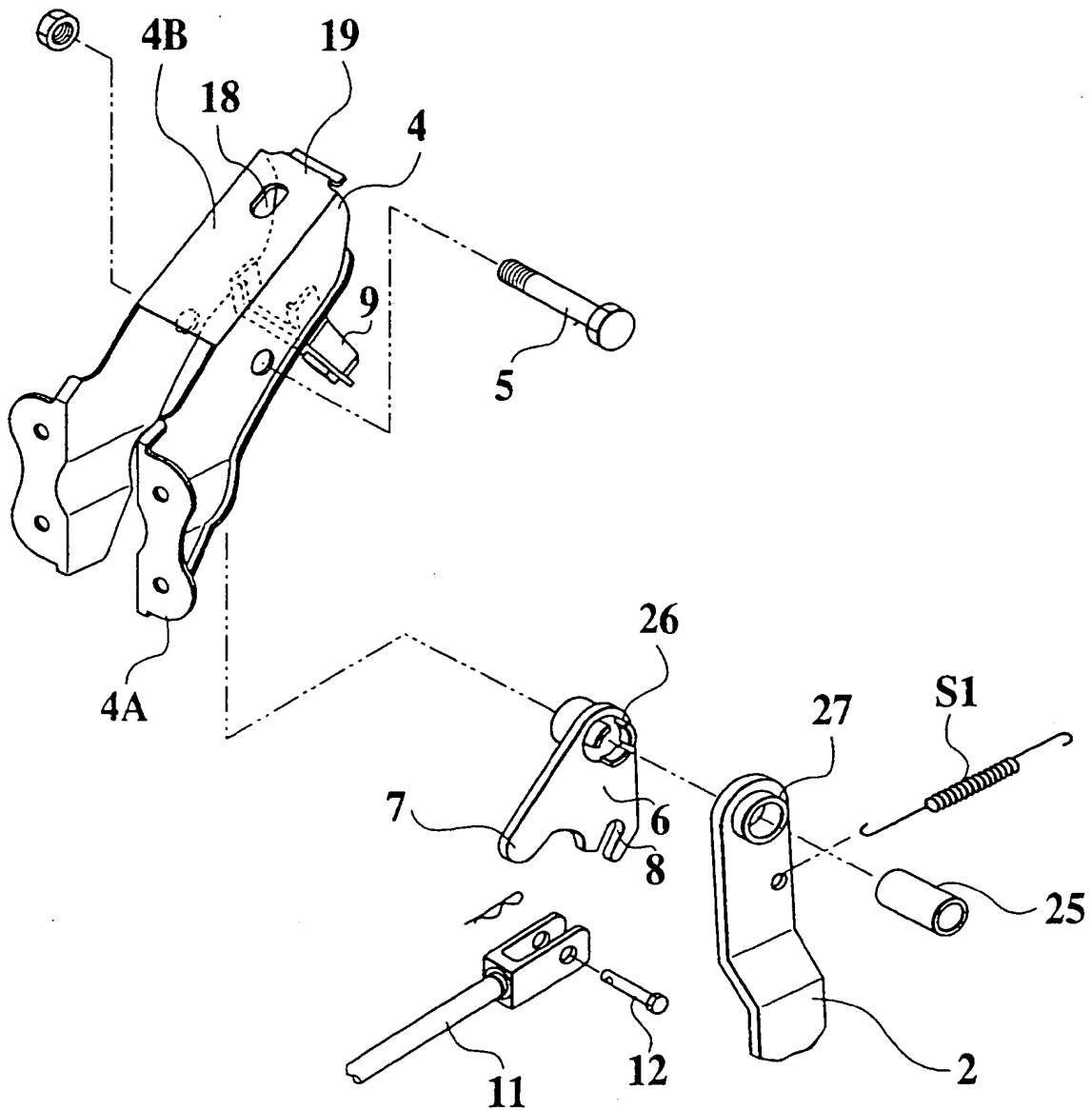
12. A brake pedal structure for a vehicle according to claim 1, wherein said push rod is connected to a Master vac of said vehicle.

**FIG.1**



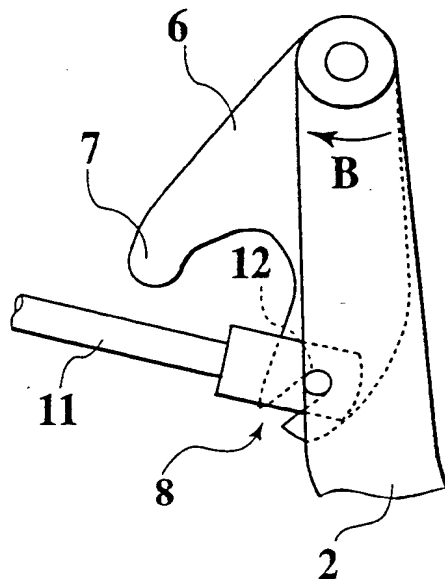


**FIG.2**

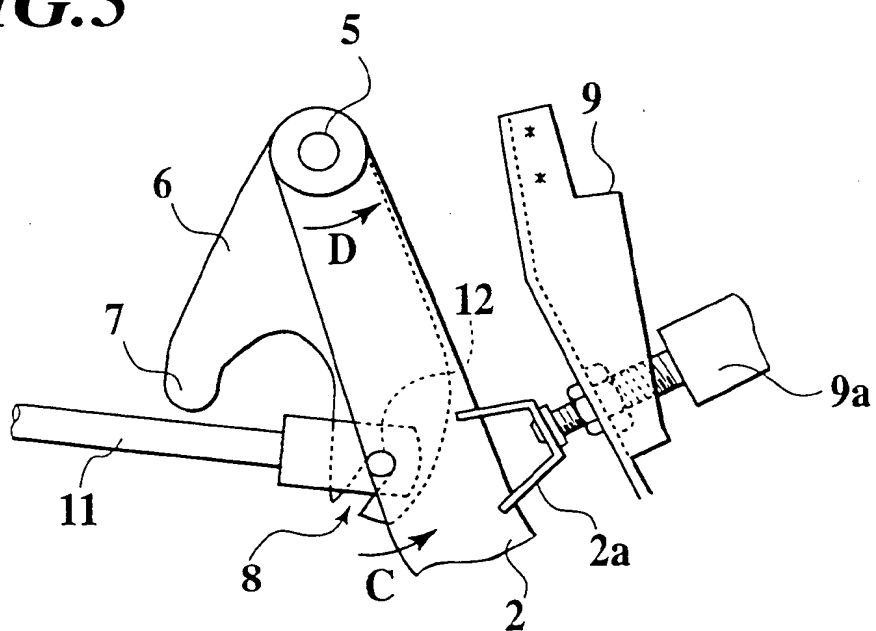




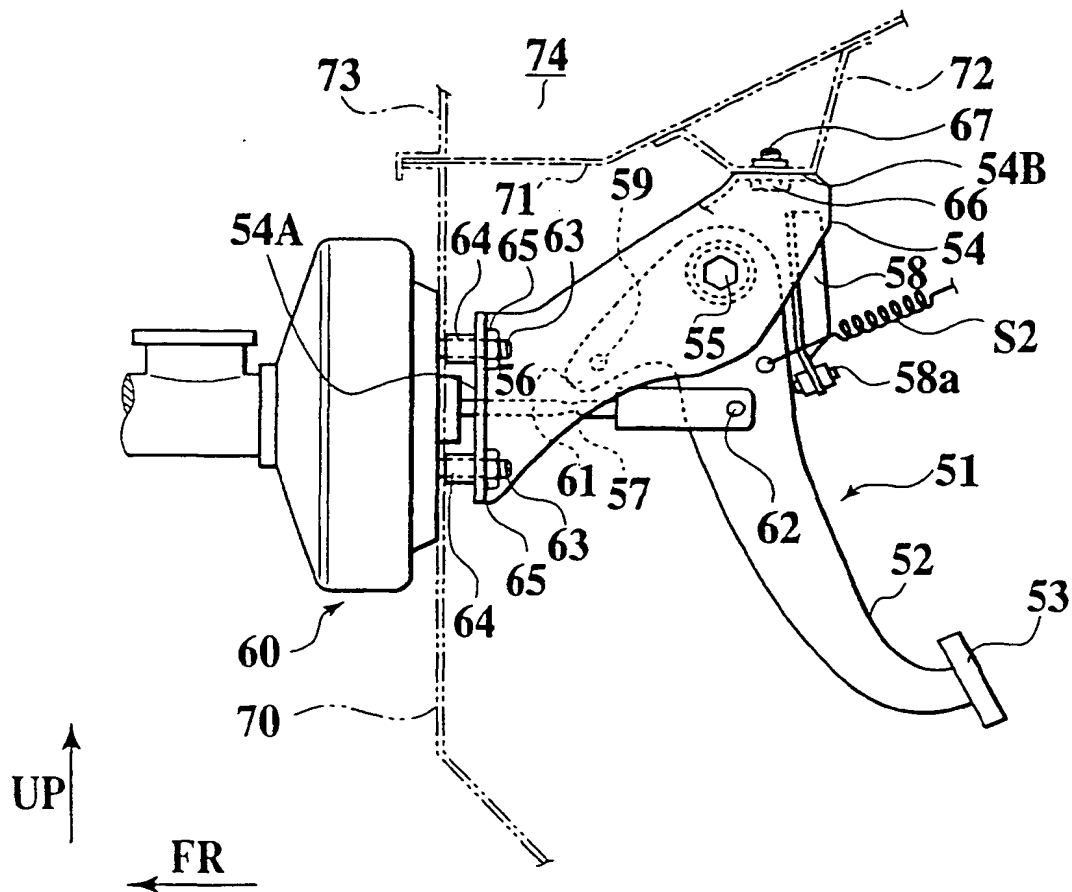
**FIG.4**



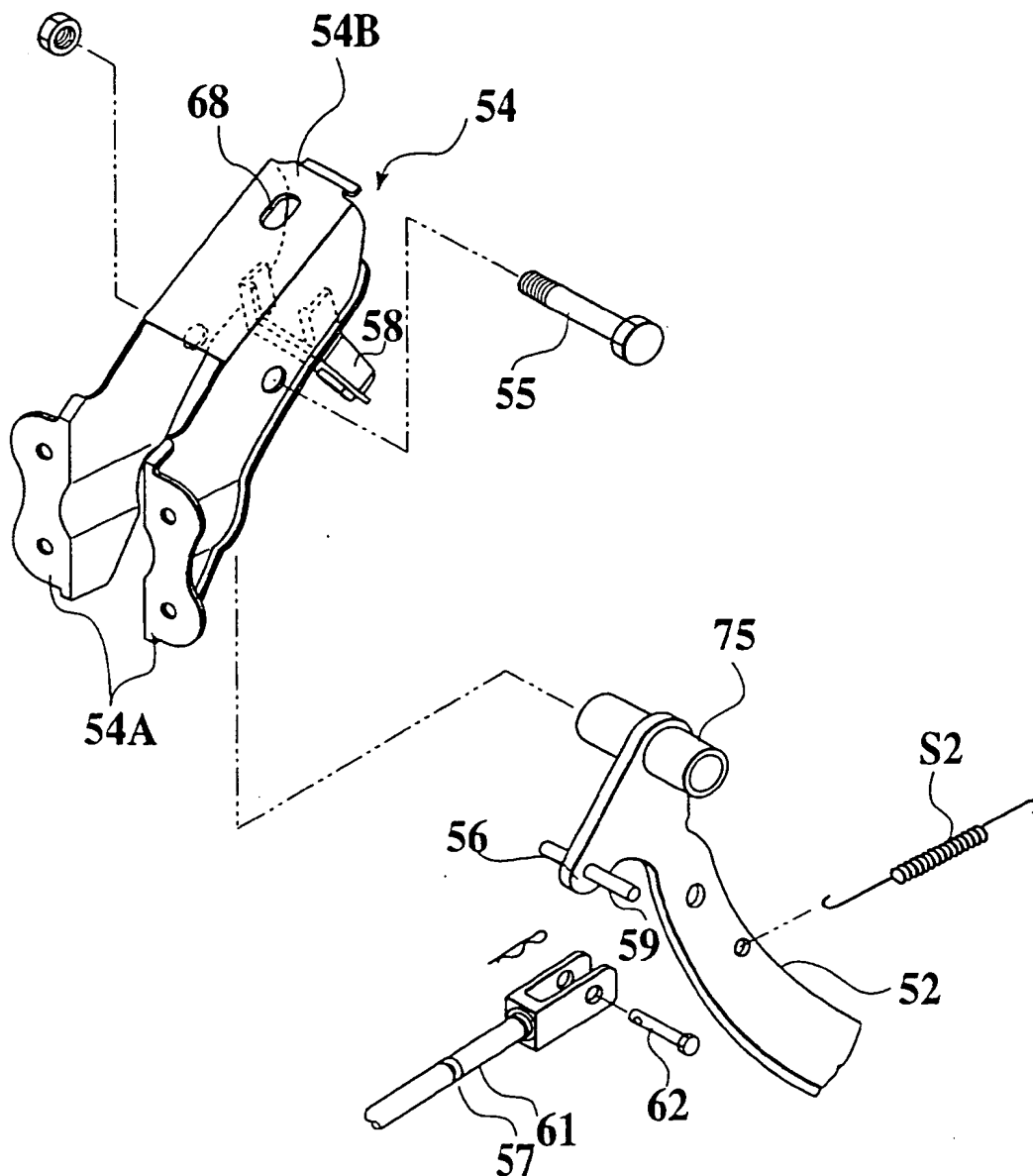
**FIG.5**



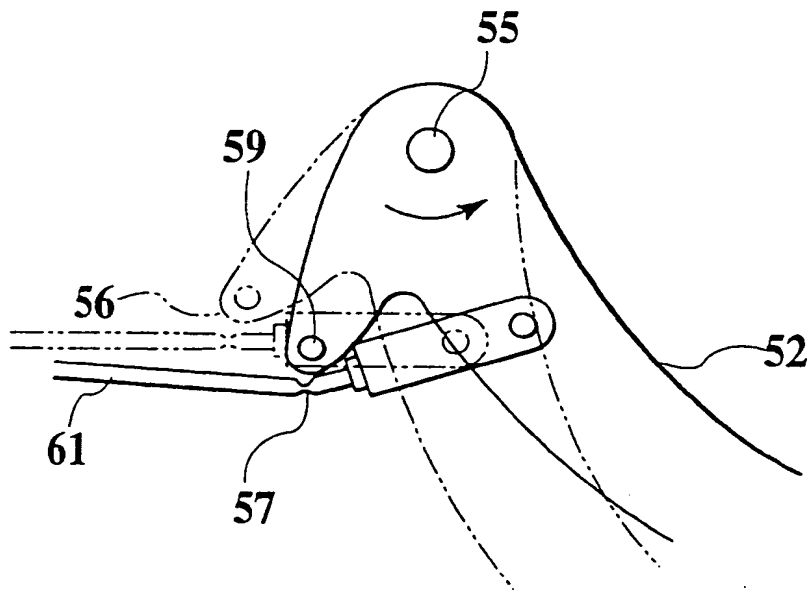
**FIG.6**

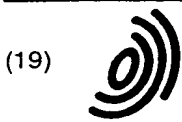


**FIG.7**



**FIG.8**





(19)

Europäisches Patentamt

European Patent Office

Office européen des brevets



(11)

EP 0 928 726 A3

(12)

## EUROPEAN PATENT APPLICATION

(88) Date of publication A3:

18.04.2001 Bulletin 2001/16

(51) Int. Cl.<sup>7</sup>: B60T 7/06

(43) Date of publication A2:

14.07.1999 Bulletin 1999/28

(21) Application number: 99100451.6

(22) Date of filing: 11.01.1999

(84) Designated Contracting States:

AT BE CH CY DE DK ES FI FR GB GR IE IT LI LU  
MC NL PT SE

Designated Extension States:

AL LT LV MK RO SI

(30) Priority: 13.01.1998 JP 509098

13.01.1998 JP 495498

(71) Applicants:

- NISSAN MOTOR CO., LTD.  
Yokohama-shi Kanagawa-ken (JP)
- Yorozu Corporation  
Yokohama-shi, Kanagawa-ken (JP)

(72) Inventors:

- Mizuma, Hiroyuki  
Hadano-shi, Kanagawa-ken (JP)

• Kawahara, Sadahiro

Ebina-shi, Kanagawa-ken (JP)

• Kobayashi, Tohru

c/o Yorozu Corporation

Yokohama-shi, Kanagawa-ken (JP)

• Gouhara, Sunao

c/o Yorozu Corporation

Yokohama-shi, Kanagawa-ken (JP)

(74) Representative:

Weber, Joachim, Dr.

Hoefer, Schmitz, Weber & Partner

Patentanwälte

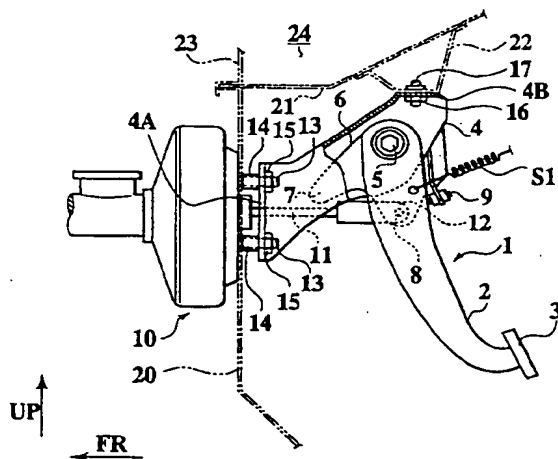
Gabriel-Max-Strasse 29

81545 München (DE)

### (54) Brake pedal structure for vehicle

(57) A brake pedal structure for a vehicle disclosed herein includes a pedal bracket (4) provided on a dash panel (20) of the vehicle, a pedal shaft (5) provided on the pedal bracket, a pedal arm (2) pivotally supported by the pedal shaft in a freely rotatable manner around the pedal shaft as a rotational axis, and a push rod (11) connected to the pedal arm for operating a brake system of the vehicle in response to rotation of the pedal arm. The push rod has a portion so as to interrupt the transmission of a load input at the time of collision of said vehicle.

FIG.1



EP 0 928 726 A3



European Patent  
Office

# EUROPEAN SEARCH REPORT

Application Number  
EP 99 10 0451

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (InCLC1.6)
X	DE 195 29 347 A (HS TECHNIK UND DESIGN) 20 February 1997 (1997-02-20) * column 5, line 20 - column 7, line 26; figures 7-14 *	1,2,7,9, 10,12	B60T7/06
A	EP 0 805 079 A (TOYOTA JIDOSHA K.K.) 5 November 1997 (1997-11-05) * column 4, line 40 - column 9, line 43; figures 1,2,5 *	1	
			TECHNICAL FIELDS SEARCHED (InCLC1.6)
			B60T B60R
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 26 February 2001	Examiner Harteveld, C
<p><b>CATEGORY OF CITED DOCUMENTS</b></p> <p>X : particularly relevant if taken alone  Y : particularly relevant if combined with another document of the same category  A : technological background  O : non-written disclosure  P : intermediate document</p> <p>T : theory or principle underlying the invention  E : earlier patent document, but published on, or after the filing date  D : document cited in the application  L : document cited for other reasons  &amp; : member of the same patent family, corresponding document</p>			

EPO FORM 1503 03 02 (P04C01)



**ANNEX TO THE EUROPEAN SEARCH REPORT  
ON EUROPEAN PATENT APPLICATION NO.**

EP 99 10 0451

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on  
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

26-02-2001

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
DE 19529347 A	20-02-1997	BR 9609961 A	02-02-1999
		DE 29623940 U	31-08-2000
		DE 59604790 D	27-04-2000
		WO 9706036 A	20-02-1997
		EP 0843630 A	27-05-1998
		ES 2145474 T	01-07-2000
		JP 11510452 T	14-09-1999
EP 0805079 A	05-11-1997	JP 9290715 A	11-11-1997
		US 5848558 A	15-12-1998

EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

**THIS PAGE BLANK (USPTO)**